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L8: Entry 1 of 1 File: USPT May 11, 1999

US-PAT-NO: 5901684
DOCUMENT-IDENTIFIER: US 5901684 A

TITLE: Method for processing crankshaft speed fluctuations for control applications

DATE-ISSUED: May 11, 1999

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
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APPL-NO: 09/152762 [PALM]
DATE FILED: September 14, 1998

PARENT-CASE:
This application is a continuation-in-part of U.S. application Ser. No. 08/901,859, filed Jul. 29, 1997, now U.S. Pat. No. 5,809,969 and assigned to the same assignee as the instant invention.

INT-CL-ISSUED: [06] F02D 41/04

INT-CL-CURRENT:

| TYPE | IPC | DATE |
|---|---|---|
| CIPS | F02 D 41/24 | 20060101 |
| CIPS | F02 D 41/34 | 20060101 |
| CIPS | F02 D 41/06 | 20060101 |
| CIPS | F02 D 41/00 | 20060101 |
| CIPS | F02 D 41/14 | 20060101 |

US-CL-ISSUED: 123/436; 73/117.3, 701/110
US-CL-CURRENT: 123/436; 701/110, 73/117.3

FIELD-OF-CLASSIFICATION-SEARCH: 123/419, 123/436, 123/480, 123/491, 73/116, 73/117.3, 701/104, 701/110, 701/111
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL | Clear

| | PAT-NO | ISSUE-DATE | PATENTEE-NAME | US-CL |
|---|---|---|---|---|
| ☐ | 4829963 | May 1989 | Oblaender et al. | 123/436 |
| ☐ | 5050554 | September 1991 | Ichikawa | 123/419 |
| ☐ | 5237862 | August 1993 | Mangrulkar et al. | 73/116 |
| ☐ | 5426587 | June 1995 | Imai et al. | 123/419 |
| ☐ | 5492102 | February 1996 | Thomas et al. | 123/493 |
| ☐ | 5544521 | August 1996 | McCombie | 73/117.3 |
| ☐ | 5605132 | February 1997 | Hori et al. | 123/436 |
| ☐ | 5630397 | May 1997 | Shimizu et al. | 123/436 |
| ☐ | 5809969 | September 1998 | Fiaschetti et al. | 123/436 |

ART-UNIT: 377

PRIMARY-EXAMINER: Argenbright; Tony M.

ATTY-AGENT-FIRM: Calcaterra; Mark P.

ABSTRACT:

A methodology of computing a learned combustion stability value and applying the learned combustion stability value to control engine operation is provided. Engine speed is sensed for each expected firing of individual cylinders ofthe engine. An expected acceleration value is determined using a band-pass-filtered engine speed difference. The difference between successive expected acceleration values is computed. A learned combustion related value is determined as a function of the difference in the successive learned acceleration values and is an indication of engine combustion quality. The operation of the engine is controlled as a function of the learned combustion related value. The learned combustion stability value is advantageously employed so as to modify the fuel injection to an internal combustion engine, especially following a cold engine start so as to reduce hydrocarbon emissions. This is accomplished by modifying a program target fuel injection value as a function of the learned combustion related value so as to reduce the fuel injected into the engine by fuel injectors.

4 Claims, 6 Drawing figures

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Drawing Description Text (7):
FIG. 5 is a graph illustrating engine fuel injection modification and shows a programmed fuel control curve contrasted with a modified fuel control curve; and

Detailed Description Text (10):
In order to illustrate operation of the fuel injection modification methodology 100, FIG. 5 illustrates a programmed target fuel injection curve 126 contrasted with a reduced fuel injection curve 128 as provided by the fuel modification multiplier determined as described in connection with FIG. 4. For a period of time following vehicle startup, the fuel modification methodology 100 utilizes the combustion metric value so as to reduce the amount of fuel injected into the individual cylinders of the engine as may be appropriate to reduce hydrocarbon emissions emitted from the vehicle. The time period for modifying the fuel injection preferably lasts long enough until effective feedback control with the oxygen sensor may be realized. The time period may be set for forty seconds, according to one example, however, varying time periods may be necessary depending upon the engine, temperature, fuel combustibility as well as other factors. According to the example shown, it is preferred that the fuel modification methodology 100 be utilized to reduce the amount of fuel injected into the engine. It is also preferred that the modified fuel injection curve 128 does not exceed the programmed target fuel injection curve 126.

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